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ABSTRACT

Scientific and technical libraries represent a fundamental link in a complex information storage and retrieval system. The handling of a large volume of scientific and technical data and provision of information library services requires the utilization of computing facilities and automation equipment, and was started in the Soviet Union on a practical scale in the middle of the nineteen-sixties. Automatic procedures have been initiated in publication of printed union catalogs, indexes, information search systems, subscriber services and library processes. (AB)

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STATE OF THE ART REVIEW

"MECHANISATION AND AUTOMATION OF INFORMATION LIBRARY PROCEDURES IN THE USSR"

by

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STATE OF THE ART REVIEW

'MECHANISATION & AUTOMATION OF INFORMATION LIBRARY PROCEDURES IN THE USSR'

A I BATENKO

GPNTB SSSR, MAY 1970

In the field of scientific and technological information services, an important part is played by scientific and technical and technological libraries, representing one of the fundamental links in a complex information system for storage and retrieval.

The successful operation of scientific and technological information services at each level of this General State System depends in great measure on the efficient utilisation of the resources in printed books and periodicals of the specialised library organisations and also their great experience and facilities for serving scientists and expert technologists. At the same time the benefits of specialised libraries within the functioning of a united system of scientific and technological information services, is considerably enriched by the inclusion in their resources of unconventional sources of information of various kinds - such as reports from scientific and technological research establishments, deposited manuscripts, and the like.

In a complex system of scientific and technological information storage and retrieval, the specialised libraries have the function of creating and maintaining a specialised information service, ie the establishment and use of source collections of data and efficient general user services based on these. At the present day, the specialised libraries in the Soviet Union, which occupy an important position at all levels of the system of scientific and technological information storage and retrieval in the Soviet Union, are expending enormous efforts in spreading among scientists and technologists data on the most recent attainments in science and technology, as well as advanced Soviet and foreign industrial progress. They have indeed become an indispensable component of a system of scientific and technological information services, with a structure based

on the principle of branch organisations combined with the centralised system for information storage and retrieval at the higher level.

One of the all-Union centres of information and library services is the State Public Scientific and Technological Library of the USSR, which acts simultaneously as a centre for research and methodology. At the level of main branch information establishments, there are about 60 scientific and technological libraries. The total number of scientific and technical libraries, in scientific research establishments, project and planning offices, and industrial undertakings, is 50,000.

The handling of a large volume of scientific research data and the requirements of incorporating data from neighbouring branches of science and technology, now require the setting up of a data-storage and retrieval organisation using the latest advances in means of collecting, evaluating and distributing of information cum-data, principally utilising automation and mechanisation in data-processing. These considerations apply also to the information library services.

The development and introduction of computing facilities and automation equipment, using computer resources, was started in the Soviet Union on a practical scale, in the middle of the nineteen-sixties.

This work started almost simultaneously in the leading libraries of national importance, in the State Public Scientific Technological Library of the USSR (GPNTB), in the V I Lenin State Library of the USSR, and in the all-Union State Library of Foreign Literature (VGBIL).

Following on the large, State and all-Union libraries, several republican libraries were co-opted for the solution of these problems. These were the

the Saltykiv-Shschedrin State Public Library, the libraries of the Lithuanian SSR, and others; as well as a number of libraries of the Higher Educational Establishments coming under the Academy of Sciences of the USSR system.

Scientific research and experimental design activities are being carried out in 3 fundamental directions:

the automation and mechanisation of individual sections of the library services (conveying books from storage to issue counter, count of visitors, book issuing, etc);

design of semi-automated equipment for library processes;

development of large, automated information-library systems.

In the third line of development principal attention was given to the automation of such operations as:

issue of printed union catalogues and various indexes to these;

issue of 'signal' bibliographical data (fast alerting publications) quickly by electronic computing means;

provision of an efficient information reference and directory system for specialist users;

establishment of data-search and retrieval systems (IPS) for retrospective search of bulk data;

select ive distribution of information by electronic computing means, which is substantially an attempt to ensure more convenient and rapid access to sourcesof scientific and technological data;

creation of a system of recording and controlling the issue and return of source literature, as well as a series of problems associated with preparation and programming of data for computerisation (indexing, coding etc) and presentation of results (layout and typography of different printed editions and reference data).

The development of an automation system for library and bibliographical procedures

is conducted with due regard to their proper place in the structure of the national network of library services and within the framework of a national system of scientific and technological information and is co-ordinated by the State Committee of the Council of Ministers of the USSR for Science and Technology through the Interdepartmental Commission on Co-ordination of the Activities of Special, Scientific and Technical Libraries.

We give below brief characteristics of the development of individual procedures (in the sphere of automation) of the library and bibliographical services.

PUBLICATION OF PRINTED UNION CATALOGUES

During 1968-69, under the auspices of the GPNTB, the V I Lenin State Library completed draft issues of printed union catalogues, with a multiple-aspect system of special indexes.

GPNTB USSR have issued 2 draft catalogues, and is proceeding with the issue of a 'Union Catalogue of Foreign Literature on Natural and Technical Sciences, Agriculture and Medicine, received by the libraries and establishments of the USSR Scientific and Technical Literature Service'. At the present time, information on new entries are supplied by 1360 libraries. The monthly average of information received, amounts to about 8,000 new, foreign books on the natural sciences, the engineering sciences, agriculture and medicine. Thus, the annual volume of an all-Union catalogue comprises no less than 75,000 titles of books (not counting periodical publications).

The fundamental requirements for printed Union catalogues (PSK) are useability and completeness of data - to allow quick identification of the location of each actual foreign, scientific-technological publication contained in any library of the USSR.

The catalogue includes an alphabetical author index, with joint authors and editors, and a systematic index to the edition section, with particulars of the titles of the different parts of the editions.

The information is supplied by the participating libraries in the form of bibliographical description (BO), on punched cards, to the section of the information on stock-holding of the GPNTB USSR, where each entry is checked for correct makeup and indexing and compared for duplication. If the card index of receipts contains a similar card, the special code is added to the new entry card; otherwise it is given a registration number until classified by the computer. There, the entry is also classified by language and the alphabetical entry in the particular entry. After this, all entries are coded in accordance with a machine-readable format.

Depending on the method chosen for the presentation of the data to be fed to the computer, the fundamental features of the system can be modified for speed, required memory capacity, facilities for information search, etc.

The method for a fixed (rigid) format applicable to a BO, lays down a fixed layout for the descriptive elements in relation to one another and also a fixed number of symbols, from which may be derived the whole description, or any one of its elements.

This method is relatively simple in application to a particular task, simplifies program development for the computer, increases the speed of the system, but has substantial defects. It requires an increasing volume of memory capacity, imposes rigid limits on the length of the document to be fed to the computer as well as on the length and content of the elements of the document, all of which are necessary for a universal and flexible system.

The second method is that fields of variable length which it is considerably

more complicated to realise, but has practically unlimited possibilities for the inclusion of additional elements and features in the document; and consequently allows the universal applicability of the processing system.

For these reasons, the developers of the printed catalogues rejected the fixed format for the entry while retaining certain restrictions in regard to document length and other features. The operating programs have been drawn up to meet a number of specific requirements, in particular:

The entries to be classified may be of varying length, within the limits of 100; 1,000 alpha-numerical characters.

The classification in depth of the entry should cover not less than 180:200 alpha-numerical characters.

Organisational markers have no fixed location in the format; their location and limits are determined by special symbols or marks, and separators.

In the development of the Printed Union Catalogue system particular importance has been attributed to the problems of syntactic control of the documents to be entered into the computerised system. To prevent the introduction of errors a program for syntactic control was set up for verifying the entries for the presence of the necessary elements.

In the event of an essential element being missing, or incorrect editing for print, an error card is produced with a note of the nature of the error. Incorrectly punched cards are completely re-processed. In the end the magnetic tape contains all the data received over a specified period (1 month).

The information is then sorted alphabetically and each entry is given a number. After producing the basic series and the corresponding indexes, the computer printed originals are passed to the editorial branch where they are collated and corrected. The corrected material is passed to the printers where they are collated and corrected. The corrected material is passed to the printers where

they are photo-offset on rotary presses and bound. The Printed Union Catalogues are then distributed to the subscribers.

The system was operated with a MINSK-22 electronic computer equipped with 'Supertyper' automatic typewriters, also used for preparation of input data, and with an expanded set of peripheral units.

At the present time the programme for preparatory automation of catalogue documents is being perfected and simultaneously with the alphabetical series, a systematic series by UDC numbers will be published.

The establishment in the country of a single system for information services raised the question of classifying all the published and unpublished scientific and technological documents under a single system which would cover all branches of knowledge, ie should be universal in content. In the USSR the accepted system has been the Universal Decimal Classification (UDK).

At the V I Lenin State Library of the USSR, attention is principally directed to the compilation of machine catalogues in printed-book form and questions of search and retrieval of information by various aspects including incomplete data.

One of the search criteria is founded on the principle adopted by the V I Lenin State Library, is the system of library and bibliographical classification (BBK).

Up to now, there have been issued experimental specimens of printed catalogues (alphabetical, systematic and subject) based on a limited number of catalogue entries. A complete bibliographical entry from a standard catalogue card and all storage references of the V I Lenin State Library are input into the computer. The catalogue entries fed to the electronic computer are analysed into fields of fixed and varying length. Priority signs for arranging catalogue

descriptions in different catalogues are established. A number of difficulties in particular due to the inadaptability of the classification systems to the algorithms of a machine search, eg the different quantity of signs corresponding to the same depth of detail search, have been identified. It is proposed that the frequency of issue of the catalogues will be fortnightly, from the last cumulation. The experimental issue of the catalogue was based on the MINSK-22 computer using data from Soviet equipment (input from punched tape). Thereafter it is proposed to use imported equipment, in particular OPTIMA-527 & 528 SUPERTYPERS, 'SCHREIBAUTOSTATS' etc. The same applies to TsPU units, but their capabilities are usually restricted, the type quality is markedly worse than printing type, and they are comparatively expensive.

The VGBIL in developing the methodological foundations of the publication of catalogues has used a numerical system of processing and publishing catalogues information on printed sources.

In December 1968, the MINSK-23 series computer was used to produce an experimental machine catalogue containing 1,045 published titles, received in 150 libraries in the country, the so-called 'Union Bulletin of New Foreign Books, Received in Libraries of the USSR'.

Special numerical indexes were used to facilitate the search for the location of registered books received. This experimental issue includes 2 indexes: a numerical index (SNU) and a regional numerical index (RNU).

The SNI is a consecutive list of registration numbers allocated to books in the all-Union printed catalogue of foreign books and the code numbers of the libraries in which they are held. Such a brief numerical list allows cumulative inclusion of the data in the SNU by means of a computer. Thus, all information on the location of every book received can be concentrated in one place. The following are the principal merits of the SNU record:

The sources are individual, bibliographical texts;

Brevity;

Possibility of periodical additions and repeat editions:

Concentration of the information on book locations in one place;

Elimination of duplication in the information contained in the PSK text; and thus

the possibility of a single entry for each book; which will reduce the volume of the printed catalogue by about 1/3 per annum.

The purpose of the RNU is to centralise the issue of regional union catalogues. The RNU is a record of the registration numbers of books received, grouped regionally, ie after coding the administrative, territorial unit, all books held in that territory are listed in numerical order. The RNU likewise states the number of copies available in the region, of each recorded book. For this, the number of the book is repeated as many times as there are copies held.

The possibilities of the method of numerical index system compiled by computers, is not restricted to the production of SNU and RNU. A further development of the system by the issue of the following numerical indexes, is contemplated:-

A numerical index according to libraries. This includes the codes of all individual libraries, followed by a numerical list of the books held therein. Such an index considerably facilitates the exchange of information of books included in the inter-library subscription scheme (MBA-ILSS);

A numerical index of the administrative affiliation of the individual libraries;

A regional numerical index of library types;

An index of regional administrative library numbers;

A numerical index by languages; in this index books are grouped by the language in which they are published;

A numerical index by country of publication. In addition, standard

numbering allows the catalogue to be complemented by various indexes showing the contents of registered books.

The experimental issue of the Printed Union Catalogue is provided with a special numerical table, which allows information to be given in the form of the registration numbers of books. Correctness of the number transmitted can be verified by a check figure which in the text of the catalogue is divided from the registered number by a dot. This control figure is obtained from the figures forming the registration number, in the form of weighted position coefficients by the computer.

In this developed methodology, the programs for solving stated problems are divided into 2 groups: the first group is intended for processing the information received in the libraries with the purpose of ultimately storing the essential data on the books in the machine memory.

The second group comprises the programs intended for retrieving the date of the indexed publications and statistical abstracts of the retrieved data: in other words, they constitute a complete or partial selection of the data and their classification by any preferred indications.

INFORMATION SEARCH (DATA SCANNING) SYSTEMS

A part of the search for documents for a particular subject enquiry is called an information search or data-scanning procedure. Recently, particular attention has been devoted to the development of automated systems on a descriptor basis.

A particular feature of the descriptor vocabulary of IPS systems is a wide subject range embracing a series of branches of science and technology. Evidently, information-search languages will become basic for a narrow-band scanning of documentary sources according to combinations of a plurality of characteristics.

It should be noted that in most of the present day, automated IPS systems the electronic computer is charged with the following duties: search within a large but specifically arranged field of scientific and technological information, and the issue of answers to a question in predetermined form. In this case the human operator carries out the indexing of the documents for entry into the computer, together with the concept evaluation of the document information, performing conceptual analysis and indexing the received requests, compiling the descriptor dictionary etc.

The V I Lenin State Library are compiling an IPS system for library techniques and bibliography. Each year, this system will receive about 15,000 documents. Indexing is performed by extracting the descriptors from the document content. The scientific and technological section in conjunction with the library specialists have commenced the compilation of Russian and English descriptor dictionaries which will allow the immediate introduction of documents containing abstracts in either of these 2 languages. The preparation of a body of working material has begun, 1,500 documents on the particular subjects have been selected. Thereafter it is proposed to utilise a technique of automatic indexing from abstracts or other condensed texts, and for books, using annotations and chapter headings.

Work is currently proceeding on the creation and introduction of a system for the selective dissemination of current information by computer. IRI systems are essentially information search systems operating in periodic search cycles for continuing requests on a body of data arriving during specified time intervals. Considering that the requests held in memory are substantially constant, the operation of an IRI system may be regarded as being easier than that of IPS systems for retrospective searches for reference and bibliographical services.

The IRI system substantially consists of using an electronic computer to distribute

to a circle of specialists, information on new acquisitions of literature on the subject which they may require for their current activities. The requirements of the specialists are presented in the form of detailed subject questions incorporating a body of distinguishing symbols.

These requests are also formulated with the help of descriptor and logical operators 'AND', 'OR', 'NOT'. Comparison of the requests with the descriptors of the documents, is carried out with a simple (not inverted) descriptor array.

In the development of a rational IRI arrangement and evaluation of its efficiency, experiments were made in Leningrad with an 'URAL-2' electronic computer, with a view to later development in a more highly developed computer. The documents used were bibliographical and annoted record cards for retrospective search on the principles used in ISP descriptors on the subject 'Antennae and Wave-Guide Techniques'. The number of descriptors and keywords in the search profile of a document averaged 7. The descriptor pattern was transferred to punched cards which also carried the running number of the document. On an average, 2.5 punched cards were used for each document.

The criterion of matching is that the documents are provided when input with a full set of the elements of the search request in the search pattern as is used in the pattern of the search request.

The search result is presented in the form of a tabular print showing the numbers of the profile lists and the number of documents issued against each profile list.

Requestors were sent photostats of the cards corresponding to the numbers of the documents selected.

Simultaneously, the requester receives a reply card on which he notes the items for which he requires originals and gives an opinion of the relevance of the documents provided with his request for information. The necessary number of copies of primary sources, based on the requests received, is then prepared. Besides determining the number of documents to be copied, the reply card is also used to evaluate the working of the system, to correct profile lists, and to analyse the errors occurring in the processing of the information.

The reply system not only permits control and improvement of the working of the CID system,, but also furnishes interesting data on the dynamics of the requests for information. The format of the reply card was developed allowing for the difference between the concepts of relevance and pertinence.

A document is classed as relevant if it objectively satisfies the request in the form presented by the requester. Objectivity was defined in the sense that correspondence between the document and the request was determined independently of the subjective information requirements of any particular expert.

A document was classed as pertinent if answered the subjective information requirement of the requester.

As a result of contact with the requesters (reply service), the following conditions for the identification of pertinent but not necessarily relevant documents have been established:

The documents referred to a fringe field, of interest to the requester;

inaccurate formulation of the request - it failed to indicate the important aspects;

The refusal of relevant documents by requesters was found to be due to the following causes:

Document already known;

Document is unintelligible owing to a lack of informative content in the bibliographical description and annotation;

The request was outdated and no longer interested the requester;

Certain aspects had been omitted in the formulation of the request, which restricted the scope of the material provided.

It will be plain from the above that the causes determining the divergence of the indices of information noise by relevance and pertinence, is in great measure associated with inaccurate formulation of the request(s).

Loss of relevance in information is shown by the analysis to be due on the one hand to defects in the descriptor system used for the document (12%); and on the other hand to defects in the actual IRI system itself, determined by incompleteness of the search program, and technical faults (35%). It is proposed to make a check of the sub-routines, which would reduce these losses to a minimum.

On an experimental basis, an orientation survey was made on the economic expenditure for development, distribution and operation of IRI systems.

Preliminary estimates have shown that service for 500 subscribers each filling an average of 10 requests, necessitating the scanning of 21,000 secondary information sources per year, could be run with 5 persons, (if only periodicals

are included in the scan, averaging 250 units per week), allowing for the need to condense their contents, not less than 11 persons will be required for the same service.

AUTOMATION OF SUBSCRIBER SERVICES

Library service problems include, besides the operational information of readers in regard to the available literature, also the up to date acquisition thereof.

In the GPNTB of the USSR, a system of automated registration, issue and return control of literature exchanged under the inter-library subscription service (MBA) is being installed.

The library stocks of the GPNTB USSR are used under the MBA scheme and also by more than 7,000 industrial undertakings, scientific establishments, universities, special libraries and other institutions of the USSR. More than 300,000 printed units are issued annually within the scheme.

The technology of this service is in 2, independent stages:

First stage: the permanent record of the subscriber (postal address, full title of the establishment or library, and the GPNTB number allocated that subscriber) is recorded on punched tape by a STA-2M teletype. This information is recorded in numerical order of subscribers on magnetic tape (ML). The information on the ML is corrected as required for change of data of the subscriber or the edition.

In addition, for each book prepared for despatch to a subscriber, a machine-readable card is typed with the store number, stock number of the printed book, and, for periodicals, year of publication, volume number, issue parts etc. This card is inserted in a special pocket bearing the same information and the whole pasted on the inside of the binding of the book.

The maximum length of the information on the card, including spaces and punctuation, should not exceed 30 characters.

Second stage: recording current information.

Using a 'Supertyper' automatic typewriter the operator records on punched tape the book's data from the machine card, and the number of the subscriber to whom it is being dispatched.

When processing information for books returned, the subscriber number is substituted by an '0'. In this case only one item is recorded on the perforated tape - the date of dispatch or return of the item.

The punched tapes bearing this record with the information relating to the issue and return of the books are fed to a MINSK-22 computer. The record of the returned book is checked against the information in store, after which the corresponding references are wiped from the magnetic tapes (ML). Thus, the tapes carry information on the state of loans under the MBA scheme.

The computer produces a registration list of the issue and return of literature for each date, and in addition, for each subscriber number to which a book has been dispatched, it gives his full postal address and a reminder of the date of return. The printed addresses are pasted on the postal wrappers and the reminder placed inside. The program automatically controls the return of the books on the date due and issues a debit notice, containing the subscriber's number, date of return of the book, and details of the same, and a printed address label which is pasted on the envelope dispatched to the subscriber.

In case of need the program can give details of what is due from any particular subscriber or subscribers. Thus, the manual search for addresses in a card file,

and writing addresses on postal covers, are completely eliminated from the library procedures. This has cut the time to dispatch of the borrowed literature by half, and practically completely excluded any errors in writing addresses.

The procedure for literature returned by subscribers has also been greatly accelerated. The machine card is withdrawn from the pocket on the book, and all its data transferred to a punched tape which at the end of the day is transferred to the computer bearing all information on books returned, and on the next day the material is returned to the store.

Thus during one day the operator of the MBA service can deal with 800-900 printed units. Manual search of the geographical card index for addresses and search for publications in the issue card index, are completely eliminated. The transfer of these operations to the computer has allowed the MBA operators to increase their productivity by nearly 6 times, and shorten the delay in returning borrowed publications from the MBA to the library store, from 5-10 days to 1-2 days only.

It is proposed later to transfer all stock-control and statistical procedures and search operations to the computer from both the stock-control and the subscriber service sections.

The V I Lenin State Library are using a computer to develop a system for transfer and distribution of readers' and subscribers' demands. The flow of demands from the individual reading rooms, amounts to nearly 500 orders per hour. The system of book storage used by the V I Lenin State Library does not exclude the possibility that individual copies of one and the same edition can be stored on different shelves and even in different blocks, which hampers the transfer of demands. The automated system of reader service which the V I Lenin State Library now proposes to adopt, will keep track of publications issued to readers and sent to subscribers; give information on the possibility of obtaining

literature from the book stores; transmit readers' requests; maintain contract with other libraries; prepare lists of literature awaiting return; carry out statistical control, etc etc. The equipment is intended to be able to handle up to 75 orders per minute and up to 200-300,000 stored units. The system is intended to employ terminal equipment (operators' desks) and a computer of the ASVT series with multiprogramming. The system will be started in stages, and completed by 1975.

In a library service the fundamental factors and requiring the highest expenditure of labour are the search for documents on a subject basis and the listing of bibliographical information, the preparation of 'Signal' publications, as well as select ive distribution of information. It is just these processes which are now being mechanised and automated primarily by the use of computers.

The experience of a number of libraries in the operation of such services is that certain of these information services have been automated independently of each other, without account of the functional link. The reason for this is essentially the wish to bring development to the level of practical application as quickly as possible in view of inadequacy of the available labour service.

It is at the same time obvious that the highest economic advantage in the application of computer methods and substantial increase in the efficiency of information handling is attainable by simultaneous automation of all 3 information procedures, taking into account their functional interdependence, and general application of individual operations and routines.

This principle can be applied to the creation of a fully automated system of data-procurement (ASIO), comprising the algorithms and programs for the computer, the machine language, technological systems and technical means by which these procedures are to be executed.

It is such a system which requires to be developed and introduced in the practice of the GPNTB USSR.

The system is intended to operate with the literature resources in a wide, polymathic field. Embodiment of the system is intended to be based on the use of third-generation computers using standard arrangements of data-preparation on punched cards and tapes, as well as visual scanning devices by CRT and teletype units.

The characteristic feature of ASIO as a system is the use of standard software at all levels in the description of documents and 'standard-form' requests, with a standard technique and preparation of the computer input.

The foundation for the development of a standard description format for the documents is the MARC II adopted as a national standard in the USA and suggested as a project for international development.

When completing the descriptive cataloguing format on account must be taken of the characteristic features of use in Soviet libraries.

The standard format will allow the computer to be fed with all the elements of a bibliographical description of the document, factographic data, descriptors or any part(s) of such descriptive elements without change and reconstruction of the input algorithms and structure of the information blocks.

The program structure of the system is laid down in the form of individual functional blocks, many of which can be used in a number of routines.

The sequence of operations indicated by the algorithms should be continuous, without the use of intermediate data which would require additional processing for continuous operation of the computer.

The results of the operations must be presented in the same form in which they will reach the requester (cards in selective distribution, page numbers of the index etc).

THE COMPLEX AUTOMATION OF LIBRARY PROCESSES

Hitherto, we have been considering the automated systems of information and library procedures based on the use of computer techniques.

However, at the present time greatest attention is being applied to the creation of automated library complexes. From this aspect it will be advantageous to consider some particular library types, in regard to their work curves, number of readers, and book stocks, and to develop for each of these types an automation system including the following basic components: book store; readers' issuing and control point, catalogue, issue desk, processing section, analysis of information and bibliography, auxiliary facilities. It is to eliminate varied solutions to the overall problem of complex automation of the total of library procedures, that attention is now being principally directed.

The Kiev State Institute of Culture is presently developing a system for automating an experimental library which will consist of an admission-recording point, catalogue, book store, issue point, reading room, and a section for the scientific, statistical processing of information.

The admission-recording point will be equipped with automatic turnstiles counting the visitors entering and leaving the library. For this, the visitor inserts a reader's ticket, made of rigid plastic, bearing his individual number, into a corresponding slot on the turnstile. The first 6 figures give information on the educational standard, profession, age and place of work of the reader; the last 4 figures are his individual, serial number.

The photoelectric unit on the turnstile reads the ticket number and transmits information on the reader through separate communication channels to corresponding counters. After converting and summing the counter readings are transferred to a numerical printout. The data thus received are passed to the scientific and statistical research unit.

The catalogue room is intended to accommodate book-ordering equipment. The reader inserts his ticket in an appropriate slot, and keys on an illuminated panel, the code number of the book required. Pressure on a button dispatches this code number to the operating memory store of the device. Simultaneously, this records the number of the reader's ticket and date of order. The signals further pass to counters recording the type of the literature ordered by classification sections (mathematics, physics, chemistry, medicine, etc). All information on book orders is recorded on paper tape.

As the requests are received the central control desk sends orders sequentially to the storage block section, whence they pass to the search and delivery section. Numbers corresponding to the book store number, rack or shelf number, and individual book number are converted into control signals applied to the inputs of conveyor controls and automatic read-outs. These activate the banks of racks installed on rails without passages between the racks, and open to give access to the particular rack indicated in the code. The search and delivery manipulator moves along the row of racks as far as the required shelf and reads the indicated book number automatically. For this purpose the back or spine of each book carries an array of light-optical reflectors consisting of concave mirror elements of 2.5-3mm diameter, arranged in a coded order. These are carried on a flexible, plastic address label which also serves to allow the book to be withdrawn from the shelf by means of a maripulator. If there is no book on the shelf, the manipulator sends a corresponding signal to the issue desk and the central control desk. The time lapse between receiving the order and delivering the book is 2-2.5 minutes.

The return of books to the shelf is also effected by the manipulator. For this, the books are stacked in a reception bin in no particular order. The automatic readers scan the book address on the address label and corresponding control signals are dispatched to the manipulator which searches for the rack and shelf required. The book is placed in the shelf as last in the row of books already on the latter. Thus, the location of the book on the shelf is not fixed, which allows the use of a fairly simple, automatic manipulator, without the book being assigned an invariable place order.

This automation system will be investigated during a long operating period in the experimental library of the Kiev State Institute of Culture.

A number of academic and educational libraries of the Republics are already conducting researches on the automation of recording and statistical operations using machine-sorted punched cards.

Analysis of the data recovered furnish practical results for improving the quality of book stocks, perfecting the service to readers, and the recording and return of books under the MBA subscriber scheme.

A BATENKO

NOTE ON THE TRANSLATION.

Lack of detailed information on Soviet library and information practice has made it difficult to deduce the meaning of certain passages from the context of the Russian original. This translation has therefore been edited to give the best overall meaning that can be deduced from the text.

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